Canada-Manitoba

FLOOD DAMAGE REDUCTION PROGRAM

Annual Report

1983 - 1984

October 1984

Government of Canada Gouvernement du Canada Government of Manitoba Gouvernement du Manitoba

CANADA-MANITOBA

FLOOD DAMAGE REDUCTION PROGRAM

ANNUAL REPORT

FOR

THE PERIOD

APRIL 1, 1983 TO MARCH 31, 1984

Environment Canada
Inland Waters Directorate
Western and Northern Region
1901 Victoria Avenue
Regina, Saskatchewan
S4P 3R4

Province of Manitoba
Department of Natural Resources
Water Resources Branch
1577 Dublin Avenue
Winnipeg, Manitoba
R3E 3J5

October, 19

CANADA – MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STEERING COMMITTEE

The Honourable Suzanne Blais-Grenier
Minister
Department of the Environment
Ottawa, Ontario
K1A OH3

The Honourable Al Mackling
Minister
Department of Natural Resources
Winnipeg, Manitoba
ROC OV8

Ministers:

I am pleased to present the seventh Annual Report of the Canada-Manitoba Steering Committee on the Flood Damage Reduction Program. This report covers the work conducted and progress made during the period April 1, 1983 to March 31, 1984. This work is included in the program authorized by the Flood Damage Reduction Agreements signed by Canada and Manitoba on December 20, 1976 and by the Amending Agreement and Flood Forecasting Agreement signed on March 31, 1981.

The year was highlighted by the completion of Phase I of the Flood Forecasting Agreement and the start of Phase II of that same Agreement. Good progress was made on the technical activities such as mapping, hydrology and hydraulic studies which will provide the information and maps required for designation in future years. The communities of Swan River and Dauphin were designated on May 11, 1983 and February 15, 1984, respectively.

During the reporting period, expenditures totalling $333,928.28 were shared equally between Canada and Manitoba.

Yours truly,

N. Mudry
Chairman, Steering Committee
1577 Dublin Avenue
Winnipeg, Manitoba
R3E 3J5

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SUMMARY

Two designations of flood risk areas occurred in 1983/84. The area along the Swan River in the Town of Swan River and adjoining areas in the R.M. of Swan River was designated on May 11, 1983. The area along the Vermilion River in the Town of Dauphin and adjoining areas in the R.M. of Dauphin was designated on February 15, 1984. Public information maps showing the flood risk areas and brochures explaining the flood damage reduction program were distributed.

Aerial photographs were successfully obtained for the remaining areas to be mapped. These areas are the Town of The Pas, The Town of Virden, the La Salle River within the City of Winnipeg and certain areas along the Red and Assiniboine rivers in Winnipeg which had not been mapped previously.

Hydraulic studies were completed for Arborg, Lorette and Morden. Preliminary flood lines were shown to the Councils concerned and their comments requested. It is expected that these communities will be designated during 1984/85.

Progress in the flood damage reduction studies was slow because available staff were employed almost full time in the flood risk mapping program.

The consulting firm of ECOS Engineering Services completed the report on the preparation of a flood damage data base for the 1979 Flood on the Red River and derivation of new depth-damage curves. This report will now allow more accurate determination of potential flood damages in Manitoba.

Under the Flood Forecasting Agreement, Phase I, Planning and Design was completed. Approval was received for proceeding with Phase II,

and Phase II work began on February 4, 1984. A Summary Report for Phase I was completed in December 1983, and a full Technical Report for Phase I will be completed during 1984.

A total of $333,925.28 was spent in 1983/84. Of this $207,767.81 was spent on flood risk mapping; $125,745.92 on flood forecasting studies; and $411.55 on flood damage reduction studies.

CHAPTER I

THE CANADA-MANITOBA FLOOD DAMAGE REDUCTION AGREEMENTS

On December 20th, 1976, the Governments of Canada and Manitoba signed three agreements whose collective aim is to reduce the potential for flood damages in Manitoba over the long term. These agreements recognize that the best way to reduce flood damage potential is to keep flood prone development out of the floodplain. Protection of existing development could involve a combination of different structural and non-structural alternatives, including allowing some flooding to occur once the potential for flooding has been identified.

I.1 Introduction

The seventh Annual Report reviews work activities and progress of the Canada-Manitoba Flood Damage Reduction Program during the period from April 1, 1983 to March 31, 1984.

I.2 General Agreement Respecting Flood Damage Reduction (FDR)

The General Agreement outlines the policies respecting government undertakings and programs in flood risk areas and provides a coordinated framework for a number of implementation sub-agreements. Listed below are the agreements which are presently in effect.

I.3 Agreement Respecting Flood Risk Mapping

This Agreement provides for a flood risk mapping program to determine and subsequently designate those urban areas within Manitoba that are

prone to flooding. Appendix A lists "Areas and Floodways to be Mapped in the Province of Manitoba" as described in the original Mapping Agreement, including the additions and deletions incorporated in the Amending Agreement (noted below). Provincial and federal Orders-in-Council were passed to add the main rivers in Winnipeg to the Schedule of Centres to be mapped. A public information program is to be conducted to inform people of the merits of the program, and to encourage acceptance and active participation.

I.4 Agreement Respecting Studies for Flood Damage Reduction

The Studies Agreement provides for studies in specific problem areas to determine the most suitable measures for reducing or mitigating the damaging effects of floods on existing developments.

I.5 Amending Agreement

In order to complete all the work scheduled in the Flood Risk Mapping Agreement and because of the need for additional funds, an amending agreement was negotiated between Canada and Manitoba during 1980/81.

The major changes to the three flood damage reduction agreements were the extension of time and the increase in funding. The General Agreement was extended to December 31, 1990. The Mapping Agreement was extended to December 31, 1984 with additional funds of $1,490,000. The termination date of the Studies Agreement was changed to December 31, 1985 with no additional funding.

Beausejour was removed from the list of places to be mapped because there is no serious flood problem there. It was replaced by the Town of Gimli.

I.6 Agreement Respecting Flood Forecasting

The Flood Forecasting Agreement, a sub-agreement to the General Agreement, was signed by Canada and Manitoba on March 31, 1981. The objective of the Agreement is to improve the flood forecasting for the Red, Assiniboine and Souris rivers in Manitoba.

This Agreement is divided into two phases. The first phase includes a pilot project on the Boyne River to develop a suitable improved streamflow forecasting model and to establish a Canada-Manitoba flood forecasting centre located in Winnipeg. The second phase, now underway, provides for the development of improved flood forecasting procedures for the Red, Assiniboine and Souris rivers.

I.7 Agreement Respecting the Upgrading of Ring-Dykes

An agreement to upgrade the ring-dykes at eight communities along the Red River was signed on March 10, 1983. This agreement provides up to $4.5 million to raise existing ring-dykes at Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe to withstand a 100-year flood. The federal government has agreed to fund 45 percent of the capital cost of the project while the Province is responsible for 55 percent. Ring dykes are the only practical measures to protect existing and future development in these communities. Flood waters spread out for many kilometres in the very flat valley and the alternative of diverting development to areas which are not flood prone does not exist. The negotiation of the Ring-Dykes Agreement was coordinated through the mechanism of the

Flood Damage Reduction Steering Committee. However, it is not part of the Flood Damage Reduction Program and will be managed and reported to the Ministers separately.

CHAPTER II

PROGRAM ORGANIZATION

II.1 Introduction

Under the terms of the General Agreement, a Steering Committee was established consisting of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. The Steering Committee provides direction for the program and reports to the Ministers annually.

A Technical Committee on Flood Risk Mapping was established under the terms of the Flood Risk Mapping Agreement consisting of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. This committee supervises and conducts the work program of the Mapping Agreement, and reports to the Steering Committee.

A Studies Sub-Committee was established in mid-1981 by the Steering Committee to oversee the work conducted under the Flood Damage Reduction Studies Agreement. This informal Sub-Committee consists of three members. The federal Co-Chairman of the Steering Committee appointed one member, while the provincial Co-Chairman of the Steering Committee appointed two members. The Chairman of the Studies Sub-Committee reports to the Steering Committee.

A Technical Sub-Committee on Flood Forecasting was established under the terms of the Flood Forecasting Agreement consisting of two members appointed by the federal Co-Chairman of the Steering Committee and two members

appointed by the provincial Co-Chairman. This Sub-Committee supervises and undertakes the task of the Flood Forecasting Agreement, and reports to the Steering Committee.

II.2 Membership: Steering Committee

The membership of the Steering Committee for 1983/84 was as follows:

Canada	Manitoba
Mr. D. A. Davis (Co-Chairman) Regional Director Inland Waters Directorate Western and Northern Region Environment Canada Regina, Saskatchewan	Mr. N. Mudry (Co-Chairman) Chief of Water Management Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. R. L. Pentland Director Water Planning and Management Inland Waters Directorate Environment Canada Ottawa, Ontario	Mr. J. N. Whiting Director Municipal Planning Branch Department of Municipal Affairs Winnipeg, Manitoba

In accordance with guidelines established in the General Agreement, the chairmanship alternated back to the provincial side of the Steering Committee during the seventh year of the program. Mr. Mudry served as Chairman at the three meetings held in Winnipeg during the report year. Mr. W. Watters acted as Secretary for the meetings.

II.3 Membership: Technical Committee on Flood Risk Mapping

The following was the membership of the Technical Committee at the end of 1983/84:

Canada

Mr. H. Naik (Co-Chairman)
Senior Water Resources Planner
Water Planning and Management Branch
Western and Northern Region
Environment Canada
Regina, Saskatchewan

Mr. J. R. R. Gauthier
Head
Data Acquisition and Program
Planning Group
Topographical Survey Directorate
Energy, Mines and Resources Canada
Ottawa, Ontario

Manitoba

Mr. F. P. Barlishen (Co-Chairman)
Head
Conservation Districts Section
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Dr. H. Moniwa
Chief
Topographic Mapping Section
Surveys and Mapping Branch
Department of Natural Resources
Winnipeg, Manitoba

Dr. Moniwa replaced Mr. Crandall as the member from the Surveys and Mapping Branch on March 15, 1984.

Based on the same guidelines as for the Steering Committee, the federal side resumed the chairmanship for fiscal year 1983/84. Mr. Naik chaired the two meetings held during the reporting period. Mr. G. Weiss of Environment Canada, Regina served as Secretary.

II.4 Membership: Studies Sub-Committee

The membership of the Studies Sub-Committee at the end of the reporting year was as follows:

Canada

Mr. H. Naik (Co-Chairman)
Senior Water Resources Planner
Water Planning and Management Branch
Western and Northern Region
Environment Canada
Regina, Saskatchewan

Manitoba

Mr. F. P. Barlishen (Co-Chairman)
Head
Conservation Districts Section
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Dr. H. Schellenberg
Agricultural Resource Economist
Department of Agriculture
Winnipeg, Manitoba

Based on the same guidelines as for the Steering Committee, the provincial side resumed the chairmanship for the fiscal year 1983/84. There was no meeting held during the reporting period.

II.5 Membership: Technical Sub-Committee on Flood Forecasting

The following was the membership of the Technical Sub-Committee for the report year:

Canada	Manitoba
Mr. D. R. Kimmett (Co-Chairman) Regional Chief Water Resources Branch Environment Canada Winnipeg, Manitoba	Mr. V. M. Austford (Co-Chairman) Chief of Water Investigations Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. R. Raddatz Scientific Services Meteorologist Scientific Services Division Atmospheric Environment Service Environment Canada Winnipeg, Manitoba	Mr. R. J. Bowering Head Hydrology Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba

Mr. Austford was Chairman during the 1983/84 fiscal year and six meetings were held in Winnipeg during the reporting period. Mr. A. Warkentin of the Manitoba Water Resources Branch acted as Secretary.

CHAPTER III

PROGRAM IMPLEMENTATION

III.1 Scope

Originally, flood risk maps and flood damage reduction studies were to be prepared for 45 communities in Manitoba as listed in Schedule A of the Agreement Respecting Flood Risk Mapping (this schedule with amendments and additions is shown as Appendix A). A location map is attached as Appendix B. However, Canada and Manitoba signed an agreement on March 10, 1983 under which they have agreed to share the cost of upgrading existing dyking systems to the one percent protection level in eight of these communities. Therefore mapping or studies will not be necessary for the communities of Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild or St. Adolphe when the proposed works are constructed.

Flood risk areas are determined and plotted on detailed engineering maps and smaller scale public information maps. Policies which discourage further flood-prone development come into effect when the Minister of Environment for Canada and the Minister of Natural Resources for Manitoba designate the flood risk areas.

In communities where flood damage reduction studies are deemed necessary, an analysis is undertaken to determine the most economical and suitable measures to protect existing development from future flood damages. Agreements are negotiated to fund the construction of flood protective works if such works are shown to be feasible and economically viable.

Improved flood forecasting procedures are being developed for the Red, Assiniboine and Souris rivers in Manitoba under the Flood Forecasting

Program. A Canada-Manitoba flood forecasting centre was established in Winnipeg as part of Phase One under the Agreement Respecting Flood Forecasting.

III.2 Schedule

During the first year of the Flood Damage Reduction Program, a community work program schedule was prepared for the 45 centres to be mapped, based on flood history, and recognizing the potential for future developments in undeveloped urban flood prone areas. Since then, the City of Winnipeg and the Additional Zone were added to Schedule A, the General Agreement was extended to 1990, the Mapping Agreement to 1984, the Studies Agreement to 1985, Phase One of the Flood Forecasting Sub-Agreement to 1984 and Phase Two to 1986. It is anticipated that further extensions to the Mapping and Studies agreements will be required.

III.3 Methodology

Flood Risk Mapping

The work program at each community for the flood risk mapping and flood damage reduction (FDR) studies begins with the preparation of 1:2000 scale maps showing planimetric and height information, known as topographic base maps. Base map production is carried out in four steps, namely, aerial photography, control survey, aerial triangulation and map compilation.

Following the map preparation, hydrologic studies are undertaken to determine the magnitude of the design flood and the watershed's response to flood-generating events. The results of these

studies function as an input to the hydraulic studies which systematically define the flood water surface profiles through the community for the design flood. The resulting flood risk lines are delineated on the 1:2000 scale maps which are used for engineering and planning purposes.

The Steering and Technical committees consult with the local government officials, to ensure that they are aware of the intent and implications of the program. They also review the delineation of the flood lines with these officials and seek their support in the implementation of the policies of the program.

When the Steering Committee has concurred in the delineation of the flood risk area and a floodway (where applicable), the preliminary flood lines, which are plotted on the 1:2000 scale maps, are presented to the local councils for their comments. The Ministers are then asked for their approval of the designation. The production of the public information map follows.

The public information program is conducted concurrently with the mapping process. Floodplain residents and the remainder of the community are made aware of the Flood Damage Reduction Program through meetings, brochures, maps and the media.

Flood Damage Reduction Studies

Flood damage reduction studies are undertaken for selected communities. The purpose is to determine the measure which has the most favourable benefit-cost ratio for minimizing flood damage

potential and also to guide future floodplain development practices. The studies will describe present land uses, assess potential flood damages and identify and evaluate alternatives for reducing the potential for flood damage. Among the range of measures considered are structural and non-structural alternatives such as dyking, floodproofing, flood forecasting systems, emergency action and zoning. Zoning and formulation of by-laws for flood prone lands at the local level of government are encouraged by program officials.

For a community where a dyke exists, the flood damage reduction study would include a geotechnical study of the dyke to assess the dyke's stability and to determine the requirement, if any, for upgrading the dyke to a standard acceptable under the Flood Damage Reduction Program. A survey by questionnaire or some other means would be undertaken in some communities in which a recent large flood occurred. This survey would be conducted to determine the exact extent of damage caused by that flood and is used for calculating the damages that would be caused by the design flood. Additionally, a field survey is conducted in most communities to determine the first floor elevations of all structures in the flood risk area. The study report is used as the basis for a recommendation to governments on construction of flood mitigation works.

Flood Forecasting

The Flood Forecasting Program is divided into two phases. In Phase I, which was completed on February 3, 1984, a pilot project was undertaken on the Boyne River watershed. This pilot project consisted of a review of runoff and flow routing models, followed by the testing and evaluation of the most promising models on the Boyne River. Results

of the detailed testing were analyzed and forecast accuracies were compared to current methods. The applicability of the models to other watersheds in the Souris, Red and Assiniboine River basins was assessed to ensure that the selected model could be used throughout the study area.

Other work in Phase I included establishment and testing of a real time hydrometeorological data acquisition system, and the formal establishment of the Canada-Manitoba Flood Forecasting Centre.

A summary report for Phase I was forwarded to the Steering Committee on December 21, 1983 and a seminar to review the results held. The report recommended that Phase II proceed and that the HSPF model be applied to selected watersheds in the Red, Souris and Assiniboine River basins. The Steering Committee accepted the recommendations and recommended to the Ministers that Phase II be carried out. The full technical report for Phase I will be available during 1984.

Approval for proceeding with Phase II was received in January, 1984. Phase II studies are now underway and include contact with United States forecasting agencies.

III.4 Work Assignments

All work activities under the Flood Damage Reduction Program are conducted under the general direction of the Steering Committee. The Flood Risk Mapping Technical Committee, the Studies Sub-Committee and the Flood Forecasting Sub-Committee supervise the work in their respective programs, and report to the Steering Committee on progress of work and on major issues.

The 1:2000 base maps and smaller scale public information maps have been compiled by private contractors. The inspection responsibility has been vested in the Director of Topographical Survey Division, Surveys and Mapping Branch of the Federal Department of Energy, Mines and Resources. The Surveys and Mapping Branch of the Manitoba Department of Natural Resources has been responsible for the administration of tender invitation and awarding all contract work in accordance with the provincial contracting policies and the FDR Mapping Agreement.

The Water Resources Branch (WRB) of the Manitoba Department of Natural Resources conducts all of the hydrologic and the majority of the hydraulic studies. In 1983/84, the hydraulic study for the Town of Neepawa was continued by Environment Canada, Ottawa. The WRB is responsible for the administration of hydraulic contracts. Cross-section surveys of the river channels were undertaken by the Engineering and Construction Branch of the Manitoba Department of Natural Resources.

The Manitoba WRB and Environment Canada, Regina, jointly conduct the public information program. Public Information Services of the Manitoba Department of Natural Resources plays an important role in this program through the preparation of brochures for each community, liaison with local officials, arrangements for meetings with local councils and the public, preparation of publicity for meetings, and provision of information to all government agencies and municipalities on the implications of the Flood Damage Reduction Program.

The Manitoba WRB plays the lead role in the forecasting studies under the Flood Forecasting Program. The Inland Waters Directorate and

the Atmospheric Environment Service of Environment Canada in Winnipeg play the lead role in testing the real-time hydrometeorological data acquisition system. The Water Planning and Management Branch of Environment Canada in Ottawa provides some technical advice.

The Manitoba Department of Natural Resources provides the initial funding for the program and submits statements to Environment Canada for cost-sharing. Under the supervision of the Technical Committee, the Manitoba WRB is responsible for the overall administration of all contracts under the Flood Damage Reduction Program.

III.5 Expenditures

The Flood Risk Mapping Agreement originally provided for a total expenditure of $700,000 over five years, but the Amending Agreement has provided an additional $1,490,000 to complete most of the required mapping. A total of $310,000 is available for flood damage reduction studies under the Studies Agreement. A total of $600,000 has been allocated to implement the Flood Forecasting Sub-Agreement.

Expenditures from December 20, 1976 to March 31, 1984 are summarized in Table I. These costs were shared equally by Canada and Manitoba.

CHAPTER IV

ACTIVITIES UNDER THE FLOOD DAMAGE REDUCTION AGREEMENTS 1983-84

IV.1 Flood Risk Mapping Program

Designation

The most significant event in the year involved the final designations along the Swan River in the community of Swan River and along the Vermilion River in the community of Dauphin. The 100-year flood was used to delineate the flood risk areas. The following designations have been made previously by Manitoba and Canada.

Melita	-	Interim	-	December 20, 1979
Wawanesa	-	Interim	-	December 20, 1979
Winnipeg	-	Interim	-	February 15, 1980
Souris	-	Final	-	October 1, 1980
Elie	-	Final	-	November 5, 1980
Brandon	-	Final	-	March 26, 1982
Starbuck	-	Final	-	November 26, 1982
Sanford	-	Final	-	November 26, 1982
La Salle	-	Final	-	November 26, 1982

Arborg: Icelandic River

The Water Resources Branch completed the hydraulic study. Preliminary flood lines were shown to the Council of the Town of Arborg and the Reeve of the R.M. of Bifrost on December 14, 1983. Designation is expected in 1984.

Carman: Boyne River

Because of various representations from the Council of the Town of Carman and interested citizens opposing the designation of the flood

risk areas in that community, designation did not take place during the period of this report. On June 29, 1983, the Steering and Technical committees attended a public meeting in Carman called by the Town Council to outline the purpose of the Flood Damage Reduction Program and to answer questions concerning the forthcoming designation of the flood risk area at Carman. About 350 people attended.

The designation date has been set for June 13, 1984. The production of a public information map and brochure are underway.

Dauphin: Vermilion River

Designation took place on February 15, 1984. A public meeting to explain the Flood Damage Reduction Program was held on March 6, 1984.

Fisher Branch: Fisher River

The hydraulic study is almost completed. Designation might take place during 1984-85.

Gimli

No work was done during the period of this report.

Gladstone: Whitemud River

The hydrology study was completed. Very little progress was made on the hydraulic study.

Grande Pointe: Seine River

The hydrology study was completed.

Gretna: Pembina River

No work was done during the period of this report.

La Riviere: Pembina River

No work was done during the period of this report.

Lorette: Seine River

The hydraulic study was completed. The preliminary flood lines were shown to the Council of the R.M. of Tache on December 20, 1983. The Council approved the flood lines on February 27, 1984. Scribing of the 1:2000 scale engineering maps is underway. Designation will take place in late 1984.

MacGregor: Beaver Creek

A presentation of the Flood Damage Reduction Program was made to the Council of the Village of MacGregor on February 9, 1984. Also in attendance were representatives of the R.M. of North Norfolk. Some hydrometric data was obtained during the 1983 spring runoff. No work was done on the hydraulic study during the period of this report.

Melita: Souris River

Interim designation has been in effect since December 20, 1979 on a one zone basis. In 1983 Town Council requested a two zone designation. On March 14, 1983 representatives of the Steering and Technical committees met with Council to discuss a two zone final designation. Council has since decided not to proceed with the two zone designation.

Minnedosa: Little Saskatchewan River

Very little work was done on the hydraulic study during the period of this report. It is expected the study will be completed next year.

Morden: Dead Horse Creek

The hydraulic study was completed. The Council of the Town of Morden was shown the preliminary flood lines on December 13, 1983. The Council have engaged a consulting engineering firm to review the flood lines prepared by the Manitoba Water Resources Branch. Designation is unlikely to occur until 1985.

Neepawa: Whitemud River

Environment Canada is continuing the hydraulic study. It is expected to be completed by June, 1984.

Additional field surveys were done at the request of Environment Canada.

Ochre River: Ochre River

No work was done during the period of this report.

Riverton: Icelandic River

The hydraulic study is almost complete.

Ste. Anne: Seine River

The Seine River Diversion affords flood protection to the Village of Ste. Anne. Because of the low flood potential in comparison to other communities, it has been given a low priority insofar as the flood risk studies are concerned.

Ste. Rose du Lac: Turtle River

No work was done during the period of this report.

Souris: Souris River

Final designation took place on October 1, 1980 on a one zone basis. In 1983 the Council of the Town of Souris made a request to the Steering Committee to review two areas in Souris to determine if it would be possible to redesignate these areas on a two zone basis. Additional surveys of the two areas were obtained. Two meetings were held with the Town Council; on June 6, 1983 and on March 19, 1984 to discuss what the advantages would be under the two zone designation for these areas and for the whole community. Council has not yet advised the Steering Committee on whether or not it wishes to have the Steering Committee proceed with the two zone designation.

Swan River: Swan River

Designation took place on May 11, 1983. A meeting was held to inform the public of the Flood Damage Reduction Program on May 12, 1983. Public information maps and brochures were distributed.

The Pas: Saskatchewan River

New aerial photography was obtained in the spring of 1983. Data base preparation and map compilation will be done by the Manitoba Surveys and Mapping Branch. Data base preparation is underway.

Virden: Bosshill, Gopher and Scallion Creeks

New aerial photography was obtained in the spring of 1983. Data base preparation and map compilation will be done by the Manitoba Surveys and Mapping Branch. Data base preparation is underway.

Wawanesa: Souris River

Interim designation took place on December 20, 1979. No work was done towards final designation during the period of this report.

Westbourne: Whitemud River

No work was done during the period of this report.

Winnipeg: Red and Assiniboine Rivers and Tributaries

Aerial photography for the five unmapped sheets along the Red and Assiniboine rivers as well as the La Salle River within the City limit was obtained in the spring of 1983. Data base preparation and map

compilation will be done by the Manitoba Surveys and Mapping Branch.

In 1983, the City of Winnipeg made a request again to designate the flood risk areas along Omands, Sturgeon and Bunns creeks. After discussions with City representatives, it was decided that mapping of Sturgeon and Bunns creeks was not warranted as all of the land is almost fully developed. The flood risk areas of Omands Creek will be identified based on existing available City of Winnipeg maps.

Woodside: Whitemud River

No work was done during the period of this report.

Remaining Communities

As was reported in the 1982-83 Annual Report, no work is planned for Hartney, Horndean, Rosenfeld or Thompson because of the low flood potential. Flood risk mapping will not proceed at Brunkild, Dominion City, Emerson, Letellier, Morris, Rosenort, St. Adolphe and St. Jean Baptiste as an agreement was signed on March 10, 1983 between Canada and Manitoba to upgrade the level of protection offered by the existing dykes at these communities to conform to the one percent flood level which has been adopted as a minimum standard for the Manitoba FDR program.

IV.2 Flood Damage Reduction Studies Program

Some preliminary work was done for Morden. Other than that no other studies were initiated because staff has not become available.

ECOS Engineering Services Ltd. submitted the report entitled "Development of Depth-Damage Curves for Residential and Farm Structures in Southern Manitoba" on August 11, 1983. The report contains a detailed analysis of the 1979 Red River Valley flood damage data and derivation of new depth-damage curve based on the data.

IV.3 The Flood Forecasting Agreement

Phase I of the Study was completed during fiscal year 1983-84. The four watershed forecasting models were calibrated for the Boyne River basin using data for 1970, 1976 and 1979. The calibrated models were then run for 1969, 1971 and 1974 to verify how accurately they could reproduce the recorded flood flows during those years. The HSPF model was selected as the most accurate watershed model, and was recommended for use in Phase II of the Study.

During the 1982-83 fiscal year a comparison of various routing models was initiated. Further work was done on this area. Although the routing models gave different results, no model has as yet been selected as the "best" routing model.

On November 2, 1983 the Study Team conducted a seminar for the Steering Committee during which the results of Phase I were presented and discussed. On December 21, 1983 a summary report for Phase I was transmitted to the Steering Committee. This report recommended that approval be given to proceed with Phase II.

Work on Phase II commenced on February 4, 1984.

TABLE I

CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
EXPENDITURES FOR 1977-84

	1977	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1977/84 (Total)
GENERAL AGREEMENT	$ 1,000.00	$ 1,254.91	$ -	$ 478.10	$ 664.88	$ 42.00	$ -	$ 3,439.89
General Mapping	-	15,260.68	18,315.52	47,527.83	37,841.59	79,246.38	56,429.23	254,621.23
Arborg	-	-	-	10,667.29	11,212.08	6,583.48	12,548.35	41,011.20
Assiniboine River	-	-	-	1,032.00	-	-	-	1,032.00
Brandon	-	-	81,502.96	75,457.90	32,798.75	4,131.64	1,454.00	195,345.25
Carman	17,082.12	21,957.83	6,577.98	23,815.41	15,361.80	389.38	810.00	85,994.52
Dauphin	-	-	19.70	39,746.68	34,095.53	11,161.48	8,732.03	93,755.42
Elie	22,817.76	27,270.36	6,798.22	9,040.40	487.05	174.91	1,357.25	67,945.95
Fisher Branch	-	-	-	8,802.96	12,838.20	12,806.15	19,683.03	54,130.34
Gimli	-	-	-	22.55	31,333.93	1,373.00	-	32,729.48
Gladstone	-	-	-	12,208.25	21,558.28	2,442.35	5,073.58	41,282.46
Grande Pointe	-	-	21.55	14,760.86	11,969.46	-	2,006.97	28,758.84
Gretna	-	-	-	414.00	17,943.40	365.00	-	18,722.40
Hartney	-	-	-	323.00	91.00	-	-	414.00
Horndean	-	-	-	403.00	91.00	-	-	494.00
La Riviere	-	-	-	251.00	31,189.27	4,339.96	-	35,780.23
La Salle	-	8,162.39	5,673.36	14,573.01	7,862.49	4,563.43	72.48	40,907.16
Lorette	-	-	-	624.55	21,910.29	18,293.59	6,809.60	47,638.03
MacGregor	-	-	-	6,092.13	28,415.53	1,850.47	29.97	36,388.10
Melita	8,806.00	9,536.44	2,102.46	10,172.60	56.42	430.78	-	31,104.70
Minnedosa	-	-	-	12,478.02	20,989.65	3,354.27	544.21	37,366.15
Morden	-	-	2,631.07	20,373.18	23,670.63	25,407.61	27,302.71	99,385.20
Neepawa	-	-	16,088.39	28,785.60	33,242.27	5,118.02	561.33	83,795.61
Ochre River	-	-	-	19,271.85	5,756.92	-	199.30	25,228.07
Ritchot	4,772.39	13,700.31	-	312.00	-	-	-	18,784.70
Riverton	-	-	-	6,052.92	15,129.77	4,483.00	16,382.52	42,048.21
Rosenfeld	-	-	-	427.00	14,350.09	253.00	-	15,030.09
Ste. Anne	-	-	-	482.00	32,963.33	13,064.86	319.42	46,829.61
Ste. Rose du Lac	-	-	14,219.19	16,657.66	12,273.59	4,860.16	-	48,010.60
Sanford	-	-	12,939.42	11,577.82	5,990.65	5,190.43	72.46	35,770.78
Souris	14,615.24	13,515.46	3,464.92	11,088.76	44.82	711.69	-	43,440.89
Starbuck	-	-	7,382.93	13,239.36	27,204.80	16,029.98	1,651.61	65,508.68
Swan River	-	-	-	17,206.72	17,851.50	9,370.26	6,182.67	50,611.15
The Pas	-	-	-	581.00	33,909.89	24,141.17	18,866.90	77,498.96
Thompson	-	-	-	433.00	14.00	-	-	447.00
Virden	-	-	-	146.00	38,866.04	13,250.51	7,547.42	59,809.97
Wawanesa	4,491.00	4,063.76	7,034.36	12,374.19	17.78	430.78	-	28,411.87
Westbourne	-	-	-	8,239.27	6,148.00	5,167.20	3,505.82	23,060.29
Winnipeg	-	37,563.98	47,660.87	9,585.35	3,461.52	4,724.14	9,624.95	112,620.81
Woodside	-	-	-	1,336.41	1,554.51	5,776.46	-	8,667.38
Brochure	3,500.00	-	-	-	-	-	-	3,500.00
TOTAL MAPPING	$76,084.51	$151,031.12	$232,432.90	$466,583.53	$610,495.83	$289,485.54	$207,767.81	$2,033,881.33

TABLE I (CONTINUED)

	1977	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1977/84 (Total)
General Studies	$ -	$ -	$ 2,177.48	$ 6.79	$ 7,357.23	$ 1,923.15	$ -	$ 11,464.65
Brandon	-	-	-	-	15,117.52	6,298.16	-	21,415.68
Carman	-	-	476.85	-	-	-	-	476.85
Gimli	-	-	-	-	2,817.49	60.00	-	2,877.49
Gladstone	-	-	-	-	-	299.61	-	299.61
Letellier	-	-	-	-	575.93	-	-	575.93
Morden	-	-	-	-	-	3,146.21	411.55	3,475.38
Morris	-	-	-	-	195.25	-	-	195.25
Ste. Rose du Lac	-	-	-	3,982.87	8,826.82	1,215.20	-	14,024.89
Souris	-	-	-	-	4,389.62	1,215.20	-	5,571.77
Wawanesa	-	-	1,320.00	-	-	-	-	1,320.00
Winnipeg	-	-	4,368.65	261.08	361.98	-	-	4,991.71
TOTAL STUDIES	$ -	$ -	$ 8,342.98	$ 4,250.74	$ 39,641.84	$ 14,124.48	$ 411.55	$ 66,771.59
Flood Forecasting								
- Phase I	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23	$109,858.63	$ 353,618.77
- Phase II	-	-	-	-	-	-	15,887.29	15,887.29
TOTAL FLOOD FORECASTING	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23	$125,745.92	$ 369,506.06
GRAND TOTAL	$77,084.51	$152,286.12	$240,775.88	$471,312.37	$721,890.46	$476,324.25	$333,925.28	$2,473,598.87

APPENDIX "A"

AREAS AND FLOODWAYS TO BE MAPPED IN THE PROVINCE OF MANITOBA

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Brandon and R.M. of Cornwallis	Assiniboine River from west of 21-10-19 W.P.M. to east of 19-10-18 W.P.M.	No
R.M. of Portage la Prairie, R.M. of St. Francois Xavier, R.M. of Cartier and the City of Winnipeg	Assiniboine River from Portage la Prairie to the western limit of the City of Winnipeg	No
Carman and R.M. of Dufferin	Boyne River from west of 23-6-5 W.P.M. to east of 29-6-4 W.P.M.	No
Gimli and R.M. of Gimli	Overflows from the Gimli Airport Drain. Area to be mapped to be shown on location plan.	Yes
Thompson and L.G.D. of Mystery Lake	Burntwood River (to be shown on location plan)	No
Fisher Branch and L.G.D. of Fisher	Fisher River from west of 14-24-2 W.P.M. to east of 24-24-2 W.P.M.	Yes
Arborg and R.M. of Bifrost	Icelandic River from west of 22-22-2 E.P.M. to east of 24-22-2 E.P.M.	Yes
Riverton and R.M. of Bifrost	Icelandic River from south of 17-23-4 E.P.M. to north of 21-23-4 E.P.M.	Yes
Rosenort and R.M. of Morris	Morris River from south of 6-6-1 E.P.M. to north of 7-6-1 E.P.M.	No
Brunkild and R.M. of MacDonald	Morris River from south of 19-7-1 W.P.M. to north of 30-7-1 W.P.M.	No

Minnedosa and R.M. of Minto	Minnedosa River from west of 3-15-18 W.P.M. to north of 1-15-18 W.P.M.	Yes
Ochre River and R.M. of Ochre River	Ochre River from south of 9-24-17 W.P.M. to north of 15-24-17 W.P.M.	Yes
Gretna and R.M. of Rhineland	Pembina River (in 5-1-1 W.P.M.)	Yes
La Riviere and R.M. of Pembina	Pembina River from west of 25-3-10 W.P.M. to south of 19-3-9 W.P.M.	No
Emerson and R.M. of Montcalm and R.M. of Franklin	Red River from International Boundary to north of 12-1-2 E.P.M.	No
Letellier and R.M. of Montcalm	Red and Aux Marais Rivers from south of 18-2-2 E.P.M. to east of 20-2-2 E.P.M.	No
Morris and R.M. of Morris	Red and Morris Rivers from east of 35-4-1 E.P.M. to east of 2-5-1 E.P.M.	No
St. Jean Baptiste and R.M. of Montcalm	Red and Plum Rivers from south of 36-3-1 E.P.M. to north of 1-4-1 E.P.M.	No
R.M. of Ritchot and the City of Winnipeg	Red River from southern limit of R.M. of Ritchot to Red River Floodway Control Structure	Yes
Elie and R.M. of Cartier	La Salle River from north of 11-11-3 W.P.M. to south of 2-11-3 W.P.M.	Yes
Starbuck and R.M. of MacDonald	La Salle River from west of 26-9-2 W.P.M. to east of 25-9-2 W.P.M.	Yes
Sanford and R.M. of MacDonald	La Salle River from north of 30-8-1 E.P.M. to south of 29-8-1 E.P.M.	Yes
R.M. of Ritchot, R.M. of MacDonald and the City of Winnipeg	La Salle River from east of 32-8-2 E.P.M. to Red River	Yes
Dominion City and R.M. of Franklin	Roseau River from north of 19-2-3 E.P.M. to east of 20-2-3 E.P.M.	No

The Pas and L.G.D. of Consol	Saskatchewan River Pasquia River to Rahl's Island	Yes
Grande Pointe and R.M. of Ritchot	Seine River from Grande Pointe (west of 20-9-4 E.P.M.) to Red River Floodway	Yes
Lorette and R.M. of Tache	Seine River from west of 8-9-5 E.P.M. to the quarter section line of 9-9-5 E.P.M.	Yes
Ste. Anne	Seine River within the village of Ste. Anne	Yes
Winnipeg	Sturgeon Creek from P.T.H. No. 101 to Assiniboine River	No
Melita and R.M. of Arthur	Souris River from west of 31-3-26 W.P.M. to east of 6-4-26 W.P.M.	No
Hartney and R.M. of Cameron	Souris River from Hartney Dam to west of 17-6-23 W.P.M.	No
Souris and R.M. of Glenwood	Souris River from south of 33-7-21 W.P.M. to one half mile east of P.R. 250	No
Wawanesa and the R.M. of Oakland	Souris River from west of 23-7-17 W.P.M. to east of 26-7-17 W.P.M.	No
Swan River and R.M. of Swan River	Swan River from south of 26-36-27 E.P.M. to east of 28-36-27 W.P.M.	Yes
Ste. Rose du Lac and R.M. of Ste. Rose	Turtle River from Ste. Rose Dam to north of 8-24-15 W.P.M.	Yes
Dauphin and R.M. of Dauphin	Vermillion River from quarter section line of 4-25-19 W.P.M. to north of 15-25-19 W.P.M.	Yes
Gladstone and R.M. of Westbourne	Whitemud River from west of 30-14-11 W.P.M. to east of 32-14-11 W.P.M.	Yes
Westbourne and R.M. of Westbourne	Whitemud River from P.T.H. No. 4 to north of 25-13-9 W.P.M.	Yes

Woodside and R.M. of Westbourne	Whitemud River from west of 16-14-10 W.P.M. to east of 9-14-10 W.P.M.	Yes
Neepawa and R.M. of Langford	Whitemud River from southern Town Limit to north of 34-14-15 W.P.M.	No
Morden and R.M. of Stanley	Dead Horse Creek from Morden Dam to north of 8-3-5 W.P.M.	Yes
Virden and R.M. of Wallace	Gopher Creek from north of 27-10-26 W.P.M. to south of 15-10-26 W.P.M.	Yes
Horndean and R.M. of Rhineland	Hespeler Channel from quarter section Line of 9-3-2 W.P.M. to quarter section line of 10-3-2 W.P.M.	Yes
Rosenfeld and R.M. of Rhineland	Overflows from Hespeler Channel. Area to be mapped to be shown on location plan.	Yes
MacGregor and R.M. of North Norfolk	Beaver Creek. Area to be mapped to be shown on location plan.	Yes
Winnipeg and Additional Zone	Red and Assiniboine Rivers and Tributaries.	Yes

APPENDIX B
Location of Areas
in the Canada - Manitoba Flood Risk
Mapping Agreement
LEGEND:
Designated areas
Areas to be designated
Cormorant Lake
THE PAS
Lake
Winnipegosis
Lake
Winnipeg
SWAN RIVER
M
A
T
B
DAUPHIN
OCHRE RIVER
STE. ROSE DU LAC
FISHER BRANCH
RIVERTON
ARBORG
GIMLI
Lake
Manitoba
GLADSTONE
NEEPAWA
WESTBOURNE
BRANDON
VIRDEN
SOURIS
HARTNEY
MELITA
LA RIVIÈRE
ELIE
WINNIPEG
STURGEON CREEK
LA SALLE
GRANDE POINTE
LORETTE
STE. ANNE
SANFORD
ST. ADOLPHE
BRUNKILD
CARMAN
ROSEBURT
MORRIS
ST. JEAN BAPTISTE
ROSENFELD
MORDEN
HERNDEAN
DOMINION CITY
BETELLIER
EMERSON
CEM 84 05 04

POOR

QUALITY

ORIGINAL